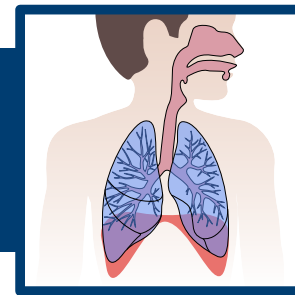


Student Background

PULMO PARK

LESSON 2: RESPIRATORY EXPLORATORY

Activity 2B: Under Pressure!



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The Mechanics of Breathing

With every breath, we take in oxygen-rich air through our nose and mouth. Air is a mixture of different gases. Approximately 20% of this mixture of gases is O_2 . When we inhale, air enters the lungs. Once in the lungs, the air moves through a series of smaller and smaller passages until the air enters the alveoli. The alveoli are surrounded by tiny, tubular blood vessels called capillaries. Oxygen diffuses (passes through from an area of high concentration to low concentration) from the alveoli and enters the circulatory system (bloodstream) where oxygen levels are low. Once in the circulatory system, O_2 binds to proteins of the red blood cells and moves through the pulmonary veins which lead to the heart. The heart pumps the oxygenated blood to the body through a series of blood vessels, starting with large arteries which branch into smaller arterioles.

The arterioles branch into even small capillaries. Capillaries are very thin – the wall of this smallest of blood vessels is only one cell thick. Once in the capillaries, the oxygenated red blood cells come in close contact with the body's cells. Cellular respiration (a metabolic process that takes place inside cells; a chemical reaction between oxygen and nutrients to generate energy) depletes oxygen and releases carbon dioxide (CO_2). Oxygen diffuses out of the capillaries and through the body cell membranes. At the same time, CO_2 , which has a high concentration inside the cells diffuses into the capillaries where CO_2 levels are low. The blood is now oxygen-poor. The capillaries transport the oxygen-poor blood into larger venules. Venules connect to even larger veins which connect to the heart. The heart pumps the oxygen-poor blood into the pulmonary arteries which carry the blood to the lungs. Again, the blood passes through arterioles into capillaries which form a net around the alveoli. Differences in concentration levels of CO_2 in the blood and O_2 in the alveoli, called a "concentration gradient" results in diffusion, with CO_2 and O_2 moving across cell membranes. The CO_2 is expelled from the body through exhalation and the O_2 moves into the bloodstream and the process repeats.